Carbon Foam Self-Heated Tooling for Out-of-Autoclave Composites Manufacturing, Phase II

Completed Technology Project (2010 - 2012)

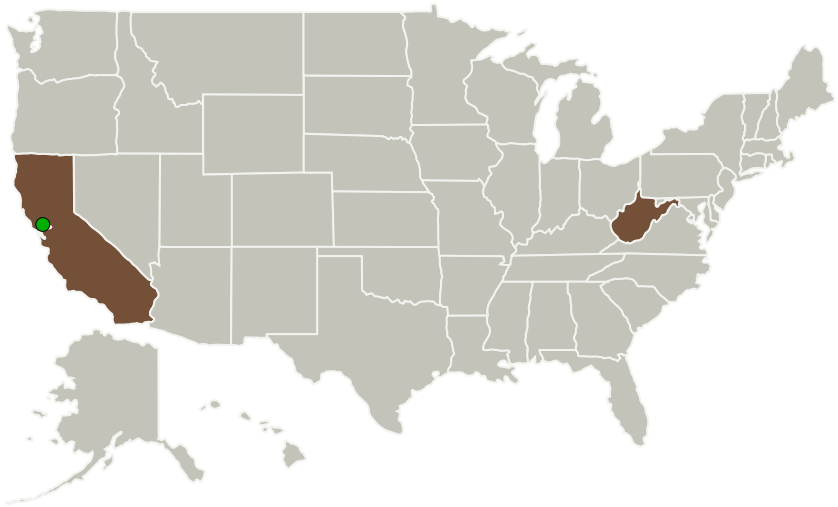
Project Introduction

Touchstone Research Laboratory, Ltd. (Touchstone) has developed a novel and innovative Out-of-Autoclave (OOA) composites manufacturing process with an electrically heated carbon foam tooling system. Electrically Heated Tooling (EHT) utilizes a coal-based carbon foam (CFOAM

REG

) core that serves as both the tool substrate and the heating source for a composite part being cured. The tool heating is a result of flowing current through the carbon foam, which results in heating. This approach to self-heated tooling is a potentially enabling technology for manufacturing large composite structures by eliminating the need for autoclaves and large curing ovens, as well as by reducing costs, weight, and improving composite part quality. The overall objective of the NASA Phase 2 program will be to optimize critical factors for thermal uniformity in a CFOAM Electrically Heated Tool (EHT) and to validate the electrically heated cure process with current state-of-the-art OOA materials. The data generated will be used to produce a Scaled Composite Shroud (SCS) cylindrical mandrel EHT that will be designed, fabricated, tested, and used to cure a large composite part without an autoclave or oven. The SCS demonstration tool will be up to an 8' diameter and 12' length mandrel, which will be approximately one-forth of the scale as a tool necessary for an ARES V composite structure.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Touchstone Research Laboratory, Ltd.	Lead Organization	Industry	Triadelphia, West Virginia
Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations	
California	West Virginia

Project Transitions

January 2010: Project Start

April 2012: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138855)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Touchstone Research Laboratory, Ltd.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

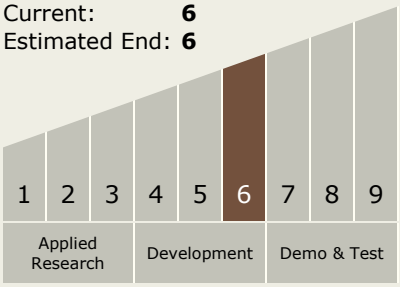
Carlos Torrez

Principal Investigator:

Rick D Lucas

Technology Maturity (TRL)

Start: **6**
Current: **6**
Estimated End: **6**



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Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.4 Manufacturing
    - TX12.4.1 Manufacturing Processes

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System